REMARKS

Allowable Subject Matter

Claims 7-17, 23, 25, 35-43, and 45-45 have been allowed.

Claims 5-6 have been objected to as dependent upon a rejected base claim. These claims would be allowed if rewritten in independent form to include all the limitations of the base claim and any intervening claims from which they depend.

Claim 49 has been added by this amendment. It is essentially a combination of claims 1 and 5. The subject matter of claims 2 and 3, however, has not been included in claim 49. It is respectfully submitted that claim 49 is directed to allowable subject matter.

Claim Rejections Under 35 U.S.C. § 112

Claims 20, 22, 24, and 26-30 stand rejected under 35 U.S.C. § 112. Claims 20, 22 and 24 have been amended to eliminate this rejection.

Claim Rejections Under 35 U.S.C. § 102

Claims 1-2, 18-20, 31-32, 44, and 47 stand rejected as allegedly anticipated by Daniel S. Swets et al., "Using Discriminant Eigenfeatures for Image Retrieval", IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 18, No. 8, pp. 831-838, August 1996 (Swets et al.).

Claim Rejections Under 35 U.S.C. § 103

Claims 3-4, 21-22, 33-34, and 48 stand rejected as allegedly obvious over Swets et al. in combination with different references.

Swets et al.

Swets et al. is directed to a system for retrieving information from an image database based on objects contained in the images. Theories of optimal linear projection are used to generate a tessellation of a space defined by training images. The space is generated using two projections: a Karhunen-Loéve projection to produce a set of Most Expressive Features (MEF) and a subsequent discriminant analysis projection to produce a set of Most Discriminating Features (MDF). (page 831, column 2, lines 17-22)

The system operates only with "well-framed" images as input for training and query-by-example test probes. "Well-framed" images are images that have only a small variation in the size, position, and orientation of the objects in the images. (page 831, column 2, lines 23-27).

The MEF projection is particularly suited for object representation. However, the features produced by that projection are not necessarily good for discriminating among classes. Classes, for example, may include human faces, street signs, aerial photographs, or other objects in an image database. The MDF projection, on the other hand, is particularly suited for classification or discriminating among classes. This is because it discounts factors unrelated to classification, such as lighting direction or facial expression, when such variations are present in the training data. (page 832, column 1, lines 35-40 and lines 45-49; page 833, column 2, lines 12-16; page 835, column 2, lines 9-14; Fig.6)

Thus, the system of Swets et al. uses the Karhunen-Loéve projection followed by the discriminant projection. This new projection is called the Discriminant Karhunen-Loéve projection (DKL projection). (page 833, column 1, lines 27-30)

A set of MEF and MDF are generated for each image in the training set. These sets are stored in a recognition module. When an image query or test probe is presented to the recognition module, it is projected to these same subspaces. A simple Euclidean distance in this feature space is computed to find a set of "k" nearest neighbors for retrieval. (page 834, column 1, lines 5-10)

The MDF space is used for classification. The MEF space is used for object representation. The MDF space computation is placed into a hierarchy and the resulting spaces are decomposed into a hierarchical Voronoi tessellation. The average search time, according to Swets et al., is considerably reduced for a test probe in this system configuration. (page 836, column 1, lines 1-8).

Claim 1 of Applicant's invention is directed to a method of constructing a vector space. The method comprises providing a raw matching score between each of a plurality of basis sample elements and each of a plurality of data samples in a first sample database. The samples in the first sample database are out-of-sample with respect to the basis sample elements. A sample space is constructed from the raw matching scores. The sample space is defined by a basis set of sample modes.

Swets et al. does not teach or suggest a method of constructing a vector space using basis sample elements and data samples. Instead, Swets et al. teaches a system that generates a tessellation space defined by training images. The space consists of MEF and MDE subspaces. Following the establishment of the MEF and the MDF subspaces, which are stored in a recognition module, the Swets et al. approach projects a query image or test probe to the MDF subspace to identify the class. The MEF subspace is used for recognition of an object within the identified class.

Swets et al. thus does not teach or suggest a method of constructing a vector space that uses two different sets of data samples, i.e., a plurality of basis sample elements in a basis database (DB_B)

and a plurality data samples in a sample database (DB_S).[1] Rather, Swets et al. teaches a method for selecting from a training set of images those images that match a query image best using a new approach called the DKL projection.

In the most recent Office Action, an image query or test probe of Swets et al. is equated to each data sample of claim 1. This is said to be consistent with claim 1 as Swets et al. uses a list of search or test probes and a list of training images such that a comparison must be made between each test probe and every image in the database. In the prior Office Action, the image query was said to be projected on each of a training set of images in the MEF and MDF subspaces.

This, however, is incorrect. The test probe is first projected to the MDF subspace for classification. It is then projected to the MEF subspace to retrieve an object within the identified class.

It is also said that the MEF and MDF projections construct a sample space from the raw matching scores with the test probe. The test probe is not used to construct a sample space. Instead, it is used to identify an object of a certain class within an image database. A sample space is not generated from any raw matching scores between a test probe and the MEF and the MDF subspaces. Rather, in Swets et al., an object in the image database is matched to the test probe.

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[1] Contrary to what was said in paragraph three of the Office Action, claim 1 does, in fact, recite a method of constructing a vector space using two sets of data samples, i.e., the basis sample elements (DB_B) and the data samples (DB_S). It is clear from the specification that the basis sample elements reside in a database. (See, e.g., Applicant's specification at pg. 8, lns. 2-3 and 32). Nonetheless, claim 1 has been amended to specify this feature. It is respectfully submitted that this clarifying amendment is not a narrowing amendment within the meaning of Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., Ltd., 122 S.Ct. 1831 (2002), since it does not affect the scope of the claim.

Other Claim Amendments

Claims 9 and 36 have been amended to correct typographical errors. Claims 27-30 have been amended to change their dependency. These are all clarifying amendments. They do not narrow the scope of the claims. See footnote 1, supra.

Conclusion

Claim 1 of Applicant's invention requires that a raw matching score be provided between each of a plurality of basis sample elements and each of a plurality of data samples. It is impossible for the method taught by Swets et al. to produce multiple raw matching scores and therefore a plurality of score vectors that are necessary for building a sample space, as required by claim 1.

Claim 31 is directed to a space construction and encoding system. It is similar to Claim 1. Therefore, for at least the same reasons, it is not anticipated by Swets et al.

Additionally, since Claims 1 and 31 are not anticipated by or obvious in view of Swets et al., the claims dependent therefrom could not possibly have been rendered obvious by Swets et al., either alone or in combination with other references.

In view of the foregoing, it is submitted that all the claims are now in condition for allowance. Accordingly, allowance of the claims at the earliest possible date is requested.

If prosecution of this application can be assisted by telephone, the Examiner is requested to call Applicant's undersigned attorney at (510) 495-3206.

Please apply any other charges or credits to deposit account number 50-388 (Order No. IDTXP040).

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Respectfully submitted,
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